

Spine Society of Australia: Biomechanics in the Barossa

26-28 May 2016 | Novotel Barossa Valley Resort



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Spine Society of Australia Continuing Medical Education Seminar

Biomechanics in the Barossa

Program Outline

Friday, May 27th

08:00-08:45 *Delegate arrival & registration*

08:45-08:50 **Welcome and Introduction - Sears**

08:50-09:20 **Biomechanical basics**

08:50-09:20 Forces – vectors, moments, pure moments

Motion – translation, rotation, degrees of freedom, etc.
McCombe

09:05-09:20 Loads acting on the spine - determined by *in vivo*
experiments - **Wilke**

09:20-10:55 **Biomechanical modelling of the spine**

In vitro

09:20-09:30 Biomechanical modelling of the spine – *in vitro*
experiments - **Wilke**

09:30-09:40 Mechanical testing methodologies for cadaver
spine: Pure moment + follower load or Bending
moment + axial load? - **Patwardhan**

09:40-09:50	<i>Questions / discussion</i>
09:50-10:10	Loading frequency/cycling – Solid phase viscoelastic behaviour & poroelastic fluid flow behaviour - Costi
	Dynamic testing - Jones
10:10-10:15	<i>Questions / discussion</i>
	<i>In vivo</i>
10:15-10:25	Human vs. animal models - Wilke
	Mathematical modelling
10:25-10:35	FEA - smoke and mirrors? - Wilke
10:35-10:45	Innovative technology: 3d specimen-specific kinematic assessment - Patwardhan
10:45-10:55	<i>Questions / discussion</i>
10:55-11:25	MORNING TEA
11:25-13:00	Components of the Functional Spinal Unit:
11:25-12:25	1. The intervertebral disc
11:25-11:40	Disc anatomy, physical properties and ultrastructure of the annular interlamellar matrix - Costi
11:40-11:55	Mechanical loading of the intervertebral disc: from the macroscopic to the cellular level - Wilke
11:55-12:05	Disc injury: Mechanisms of Disc Herniation - Wilke
12:05-12:15	Principles & biomechanical challenges of anulus sealing - Wilke
12:15-12:25	<i>Questions / discussion</i>

12:25-12:40	2. Spinal musculature Muscles as dynamic stabilizers: A new hypothesis and experimental analogue - Patwardhan
12:40-12:55	3. Facet joints & Spinal ligaments – force/displacement behaviour, injury, repair FSU stability: 6 d-o-f <i>in vitro</i> testing – Costi/Jones
12:55-13:00	<i>Questions / discussion</i>
13:00-13:45	LUNCH
13:45-15:00	Biomechanics of Instability and surgical rigid stabilisation
13:45-14:20	Spinal Instability – Overview/whole spine vs. FSU
13:45-13:55	Stability of the spinal column - The Euler model (a biomechanical analogue of progression in scoliosis) - Patwardhan
13:55-14:05	FSU instability with respect to degeneration - Wilke
14:05-14:15	6 DOF testing of degenerative FSU – facet loads/contribution to stability - Costi
14:15-14:20	<i>Questions / discussion</i>
14:20-15:20	Rigid Spinal stabilisation - Overview
14:20-14:30	Tension bands, cantilevers, buttresses. Materials properties - screws & rods (strength, stiffness, fatigue) - Costi/Jones
14:30-14:40	Screws - the bone screw interface, design elements, nomenclature & screw choice - Ryan
14:40-14:45	<i>Questions / discussion</i>

14:45-14:55	Anterior: Buttresses/cages (incl. subsidence) - Wilke
14:55-15:05	Posterior: Pedicle screw vs. cortical screw fixation; crosslinks - when & how many? Patwardhan
15:05-15:15	Sacral and iliac fixation - Sears
15:15-14:20	<i>Questions / discussion</i>

15:20-15:50 Bone – the foundation and osteoporosis

15:20-15:25	Case study with loose instrumentation - Kuru
15:25-15:35	Bone strength & osteoporosis Implants and osteoporosis - screws, subsidence, etc - Perilli
15:35-15:40	A surgeon's approach to instrumentation and osteoporosis - Kuru
15:40-15:50	<i>Questions / discussion</i>

15:50-16:20 AFTERNOON TEA

16:20-17:30 Case studies: Failure of Surgical fusion constructs

Case studies illustrating failed constructs, including proximal junctional kyphosis, exploring the likely reasons underlying failures and with questions and discussion directed to the faculty and delegates.

Surgeon and Biomechanist reference panel

17:30 CLOSE

19:00-21:30 SEMINAR DINNER

Saturday, May 28th

08:00-08:30 Cervical Sagittal balance

- 08:00-08:10 Introduction... What's normal? - **Sears**
- 08:10-08:25 Biomechanical modelling of cervical sagittal alignment - **Patwardhan**
- 08:25-08:30 *Questions / discussion*

08:30-10:00 Rigid spinal stabilisation (cervical & thoracic)

- 08:30-08:50 **Cranio-cervical**
- 08:30-08:35 Case study: occipito-cervical stabilisation - **Sears**
- 08:35-08:45 The biomechanics of occipito-cervical and atlanto-axial stabilisation - **Wilke**
- 08:45-08:50 *Questions / discussion*
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- 08:50-09:10 **Lower cervical**
- 08:50-09:00 Posterior constructs - **Patwardhan**
- 09:00-09:10 Anterior (& 360deg) – cages, plates, etc - **Wilke**
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- 09:10-09:35 **Cervico-thoracic junction**
- 09:10-09:25 Case study
- Biomechanics of junctional kyphosis - **Costi/Jones**
- 09:25-09:35 *Questions / discussion*
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- 09:35-10:00 **Thoracic**
- 09:35-09:50 Posterior and anterior constructs with focus on the biomechanics of fracture fixation - **Patwardhan**
- 09:50-10:00 *Questions / discussion*

10:00-10:30 MORNING TEA

10:30-12:40 Dynamic spinal stabilisation

10:30-10:45 **Introduction**

10:30-10:35 ASD - disease or natural history? - **Sears**

10:35-10:45 Can in vitro biomechanics explain the degeneration of adjacent segments? - **Wilke**

10:45-11:30 **Disc replacement**

10:45-10:55 Kinematics of segmental motion and disc replacement mechanisms - **McCombe**

10:55-11:00 Case studies: Kinematic mismatch - **Sears**

11:00-11:20 What is the ideal total disc replacement?
Patwardhan

11:20-11:30 *Questions / discussion*

11:30-12:10 **Nucleus replacement**

11:30-11:40 Ideas & mechanical requirements of nucleus implants - **Wilke**

11:40-11:50 Clinical requirements and results of nucleus replacement - **Diwan**

11:50-12:05 Challenges of disc tissue engineering – from bench to patient - **Neidlinger-Wilke**

12:05-12:15 *Questions / discussion*

12:15-12:45 **Posterior dynamic stabilisation**

12:15-12:25 Principles and biomechanics of pedicle screw based devices, interspinous devices and facet joint replacements - **Wilke**

12:25-12:35 Matching symptoms to biomechanical solutions
Patwardhan

12:35-12:45 *Questions / discussion*

12:45 CLOSE